Hawaiian Electric Company, Inc. • PO Box 2750 • Honolulu, HI 96840-0001

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PUBLIC UTILITIES COMMISSION

January 3, 2007

Ms. Cheryl Kikuta
Utilities Administrator
Division of Consumer Advocacy
Department of Commerce and Consumer Affairs
335 Merchant Street, Room 326
Honolulu, Hawaii 96813

Dear Ms. Kikuta:

Subject: Docket No. 05-0315
HELCO 2006 Test Year Rate Case
Responses to Supplemental Information Requests

Enclosed are Hawaii Electric Light Company, Inc.'s ("HELCO") responses to the Consumer Advocate's supplemental information requests ("SIRs") listed on Attachment A.

HELCO will provide the Commission with copies of the attached SIR response along with responses to all of the Consumer Advocate's SIRs, after the last SIR response is completed and submitted to the Consumer Advocate.

Sincerely,

Dean K. Matsuura
Director, Regulatory Affairs

Attachments

cc: Sawvel & Associates, Inc.
Utilitech, Inc.
Keahole Defense Coalition
Public Utilities Commission (w/o enclosures)

ATTACHMENT A

Responses transmitted on January 3, 2007

1

Remaining SIR Responses

2, 3

CA-SIR-1

Ref: HELCO WP-404, page 54-93.

HELCO-WP-404 pages 54-93 include "Revised from HELCO Annual Calibration Factor Report for Year 2005 filed March 15, 2006" in their titles.

a. Please explain what revisions were made to the "Calibration Factor Annual Report for Year 2005" dated March 15, 2006, to result in the analysis of HELCO-WP-404 pages 54-93.

b. Please provide equations and calculations that support your explanation.

HELCO Response:

a. As explained in HELCO T-4, page 40, line 17, to page 42, line 15, the different calibration factors were derived because different modeling techniques were used. The calibration factor that was submitted to the PUC on March 15, 2006 was derived through the use of the probabilistic modeling technique, which was the technique used in the 2000 test year rate case. The calibration factors that were submitted on HELCO-WP-404, pages 54-93 were derived using the Monte Carlo modeling technique, which is the technique used in the 2006 test year rate case. The output from the model is specific to the technique used for a given production simulation; the probabilistic technique provided one set of results and the Monte Carlo technique provided a second set of results. All the outputs for the firm dispatchable generating units on the HELCO system were revised as an outcome to rerunning the model using the Monte Carlo technique resulting in all the workpapers submitted as HELCO-WP-404, pages 54-93. Also, as explained on HELCO T-4, page 40, lines 4-14, and page 43, lines 14-19, for the instant docket, two calibration factors are being used, one for each fuel type, as shown on HELCO-WP-404, page 54, where in the March 15, 2006 filing, only a system-wide calibration factor was calculated.

b. There are no equations or calculations to show what revisions were made since the changes

were based on completely new outputs from the production simulation. HELCO T-4, page 36, lines 14-24, explains that the calibration factor is the difference between heat rates from the production simulation and from actual recorded data. The bottom of HELCO-WP-404, page 54 explains the calculation of the calibration factor. HELCO T-4, page 40, line 17, to page 41, line 13, explains the conceptual difference in the internal modeling algorithm between the two techniques.

At a conceptual level, the Monte Carlo technique uses random numbers to generate multiple production costs. The average of these production costs converges to the true production cost with $\frac{1}{\sqrt{N}}$ convergence (where N = the number of trials) as predicted by the central limit theorem which states

Central Limit Theorem[1]

Let $X_1, \ldots, X_n, \ldots$ be independent random variables that have the same distribution function and therefore the same mean μ and the same variance σ^2. Let $Y_n = X_1 + \ldots + X_n$. Then the random variable

$$Z_n = \frac{Y_n - n\mu}{\sigma\sqrt{n}}$$

is asymptotically normal with mean 0 and variance 1; that is, the distribution function $F_n(x)$ of Z_n satisfies

$$\lim_{n\to\infty} F_n(x) = \Phi(x) = \frac{1}{\sqrt{2\pi}} \int_{-\infty}^{x} e^{-u^2/2}\, du$$

By contrast, the probabilistic technique does not utilize random numbers in its production cost calculations but rather uses probability distributions. It employs a method

called "convolution" in which it combines two different probability distribution functions to obtain a production cost. Mathematically, convolution is usually defined as

$$(f * g)(t) = \int f(t-\tau)g(\tau)d\tau$$

In this case however, our probability distribution functions are discrete, so we use the discrete definition of convolution which is given by

$$(f * g)(m) = \sum_{n} f(n)g(m-n)$$

[1] Kreyszig, Erwin "Advanced Engineering Mathematics", Seventh Edition. John Wiley & Sons, Inc, 1993.